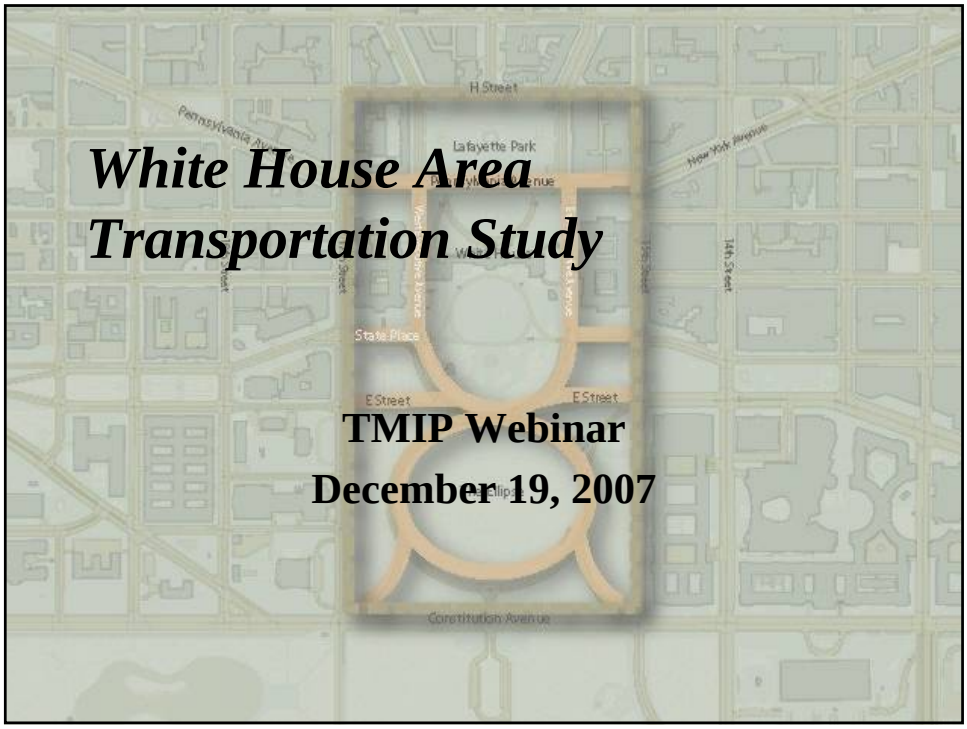


White House Area Transportation Study

TMIP Webinar

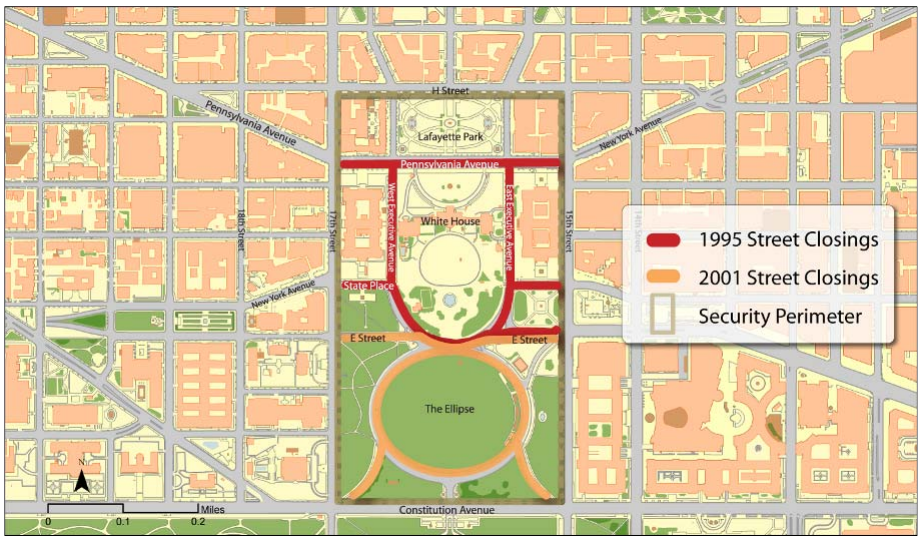
December 19, 2007

Outline

- Project Overview
- Modeling Approach
- Technical Challenges
- Presenting Results

Project Overview

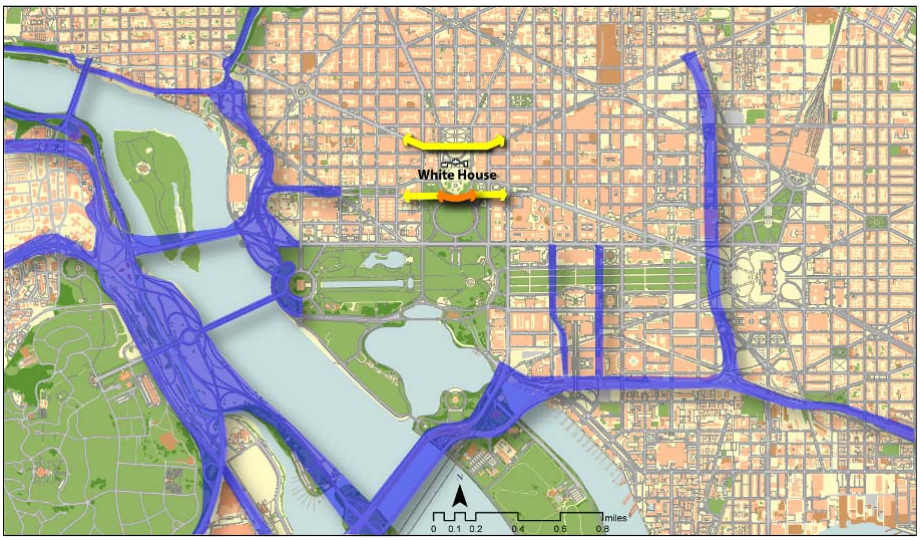
White House Area Closures



Key Transportation Impacts

- Washington D.C. has a resilient / adaptable transportation system that accommodated the closures by:
  - Inconveniencing travelers with additional travel times of up to 12 minutes per trip
  - Spreading travel over a broader geographic area
  - Exposing neighborhoods to increased pass-by traffic
  - Discouraging people from traveling in downtown

Local Connectivity



Regional Connectivity

Modeling Requirements

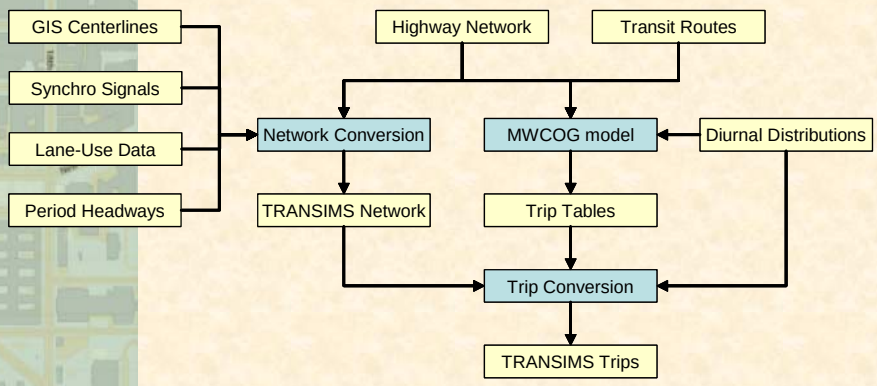
- Estimate impacts of major new facilities and minor traffic operational improvements
- Track individuals directly affected and how each alternative mitigates these impacts
- Generate statistics for all of downtown, all modes, and all times of day
- Account for time of day changes in network capacity and operations
  - traffic signals, street parking, turn restrictions, vehicle use restrictions, reversible roadways, and transit services
- Prepare for NEPA through consistency with the MWCOG model and CLRP improvements

Modeling Approach

Selected Approach

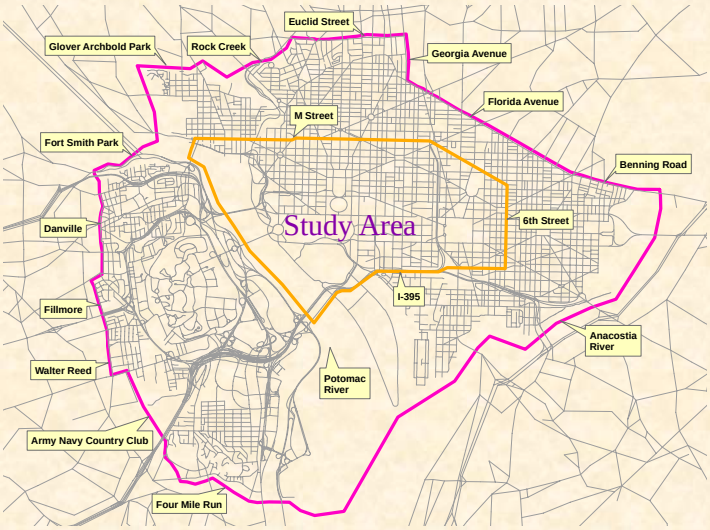
- Integrate the MWCOG regional model with a planning level simulation of the traffic and transit operations in a detailed subarea covering much of Washington D.C. and Arlington CBD
  - MWCOG trip tables and network → TRANSIMS regional routing and subarea simulation

MWCOG Model Interface

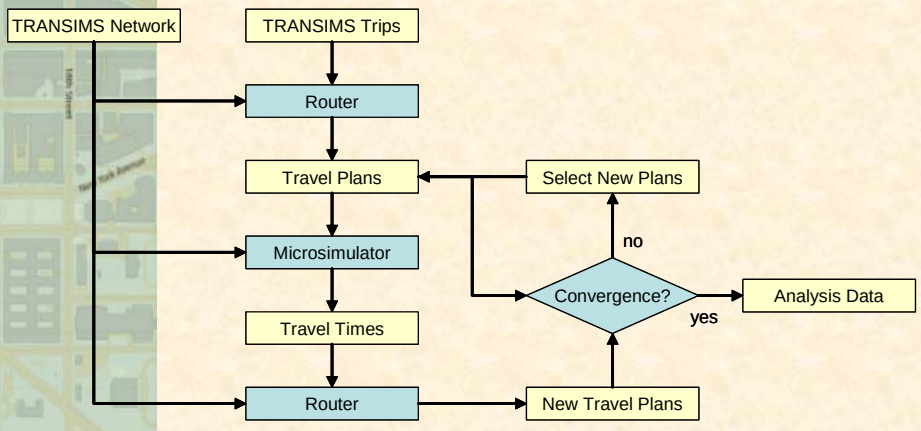


Regional Routing

Subarea Simulation



Assignment Process



Key Features of the Approach

- Directly considers MWCOG and CLRP changes
- Large simulation area enables travel path changes and the evaluation of secondary impacts
- Regional routing with subarea simulation adjusts thru traffic and trip entry/exit points
- The planning level simulation combines detailed traffic operations by time of day in the study area with synthetic controls outside of the study area
- Tracks individuals for direct comparisons of impacts and market segments between alternatives
- Includes effective visualization and analysis tools

Limitations of the Approach

- The linkage between the MWCOG model and the TRANSIMS simulation is one way
  - The trip tables are fixed – no feedback to mode choice
- Vehicle movements are limited to fixed length cells allocated to each lane of each link
  - The speed at any given second is limited to: 0.0, 13.4, 26.9, 40.3, 53.8, 67.2, or 80.6 miles per hour.
- A model application that requires 100 iterations to achieve convergence takes about 12.5 days to complete
- The overall quality of the validation would benefit from better and more consistent traffic counts

Technical Challenges

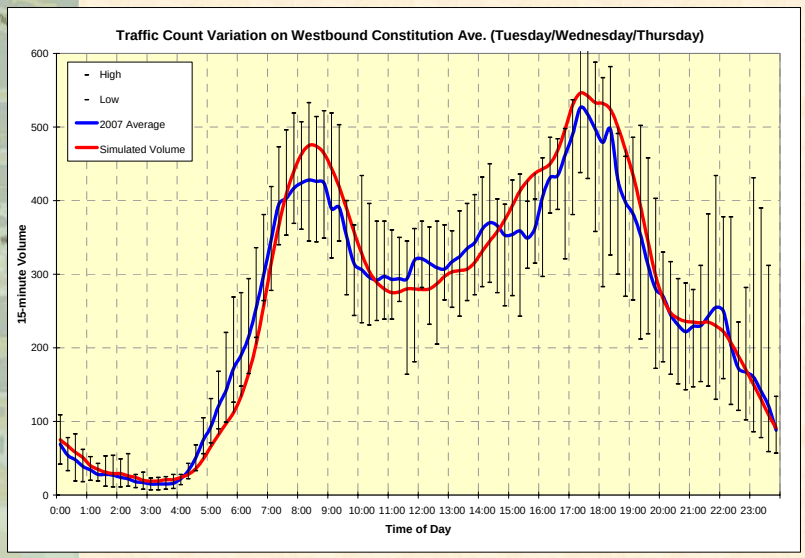
Simulation Dynamics

- "Standards" vs. Downtown
  - Smaller cell sizes to increase density
  - More random slow down and reaction time to reduce speeds
  - Less permissive lane changing in queues
- Freeways vs. Arterials
  - Originally over-estimated freeways and under-estimated arterials
  - Calibrated freeways and arterials separately

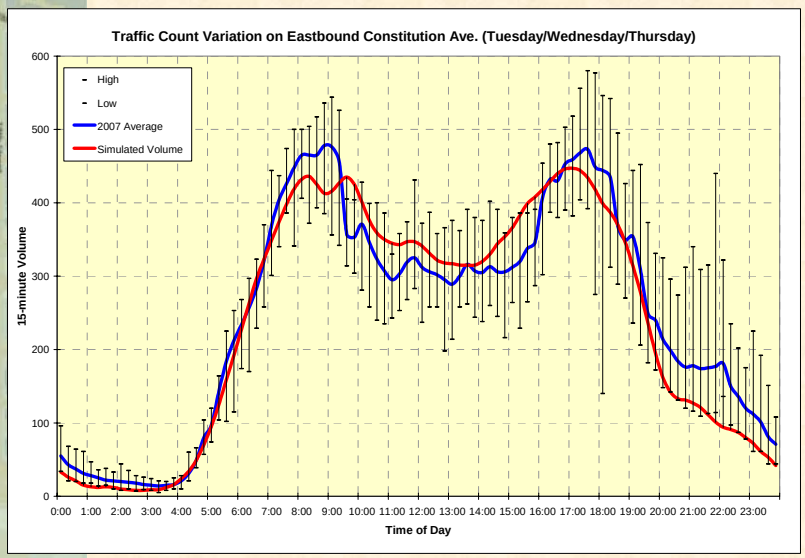
Validation Targets

- 15-minute traffic counts are needed for trip table adjustments and model validation
  - Not generally available or reliable
- Multiple count sources, years, seasons, and time periods are difficult to reconcile
  - Considered count reliability in validation weights
- Day-to-day traffic counts vary by 10-12%
  - Seasonal variations are much higher
  - Resiliency tests were used to quantify the impacts of demand changes on alternative performance

Traffic Count Comparison

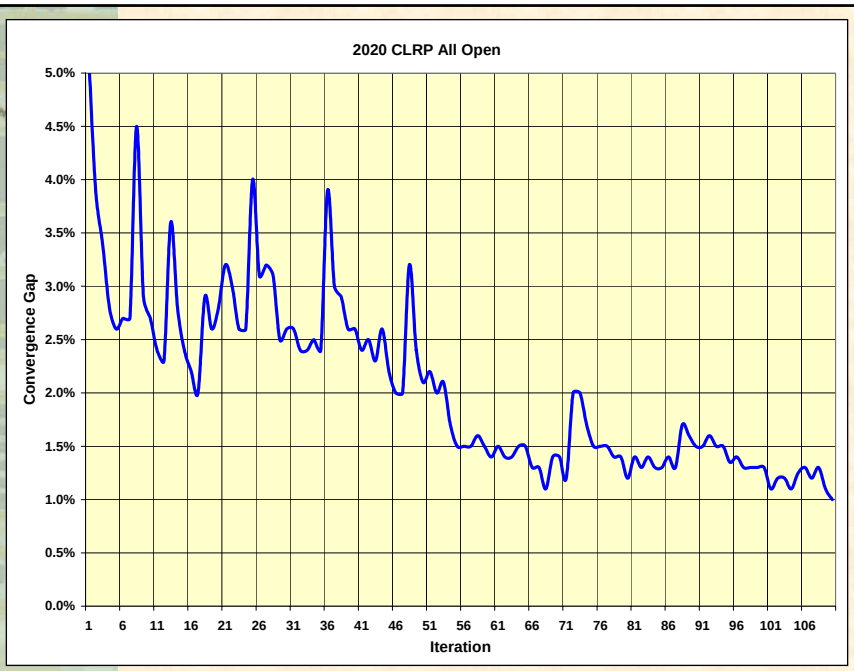


Traffic Count Comparison



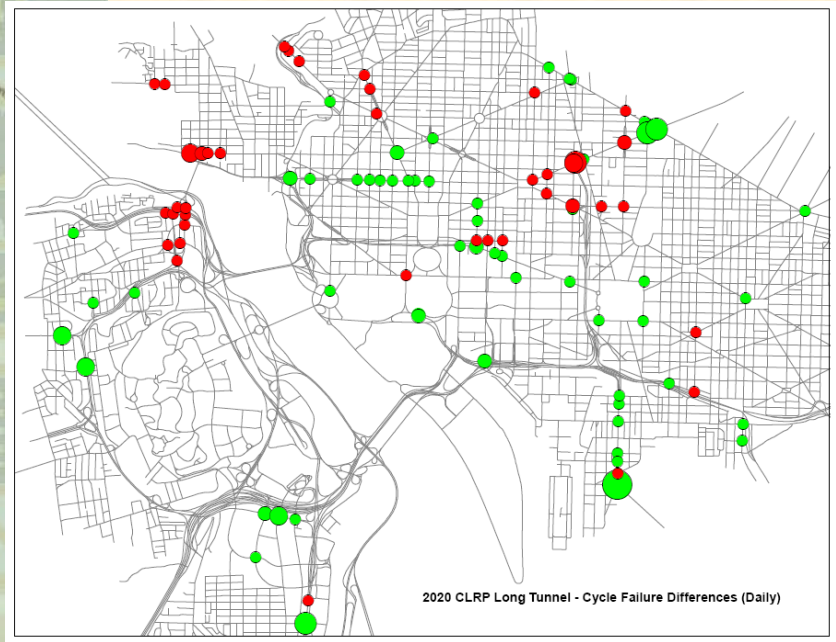
Equilibrium/Convergence

- Single path trips are realistic, but sub-optimal
  - User-equilibrium convergence is approximated
- Simulated link and turning movement delays are very sensitive to small changes in traffic
  - Stabilized by successive averaging
  - Keep the changes/iteration small
- Regional-subarea interactions need reasonably stable simulation inputs
  - Fixed subarea demand improves convergence
  - Multiple subarea iterations per regional iteration



Optimizing Traffic Controls

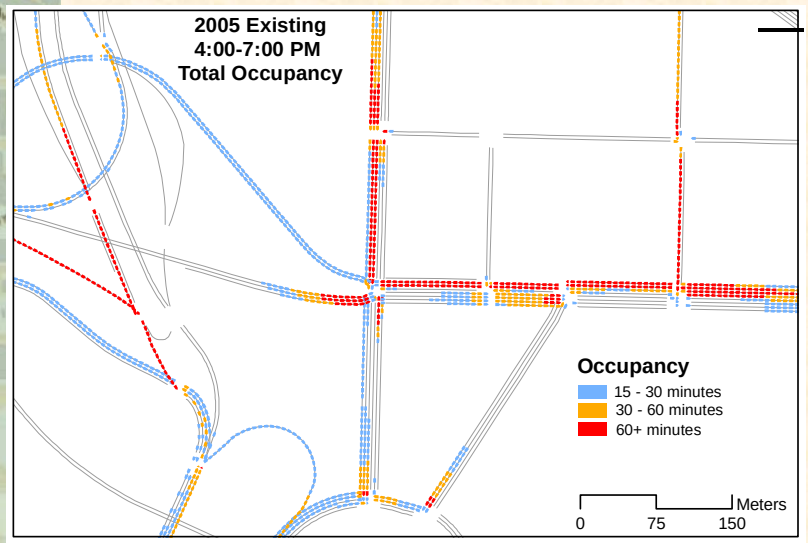
- Existing traffic controls are sub-optimal from a thru-put perspective
  - Pro-transit and pro-neighborhood policies
- Since each future alternative impacts existing traffic controls…
  - How should the system be optimized to accommodate the alternative?
  - How much of the system should be adjusted (e.g., how far away)?



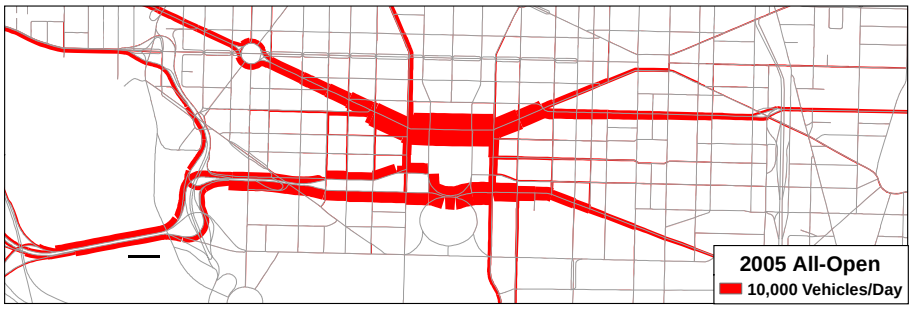
Comparing Alternatives

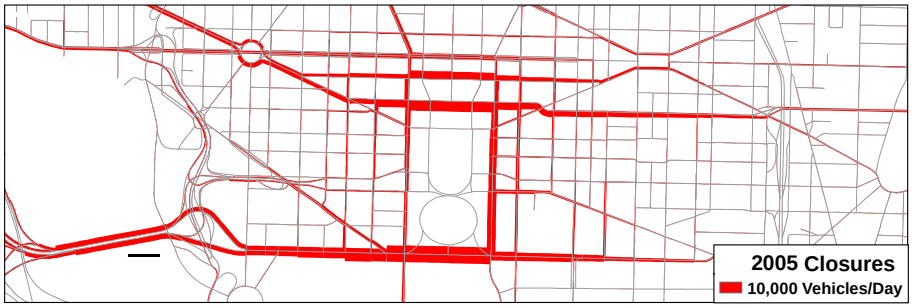
- Aggregate statistics are often misleading
  - Difficult to distinguish performance impacts from total traffic differences
  - Winners and losers average to small impacts
  - Large impacts are lost among the majority of trips with small impacts
- Comparing dynamic data is difficult
  - Hard to compare and evaluate visualizations
  - Static snapshot images are rarely representative
  - Aggregate views of vehicle movements present congestion more effectively

Cell Occupancy Rates

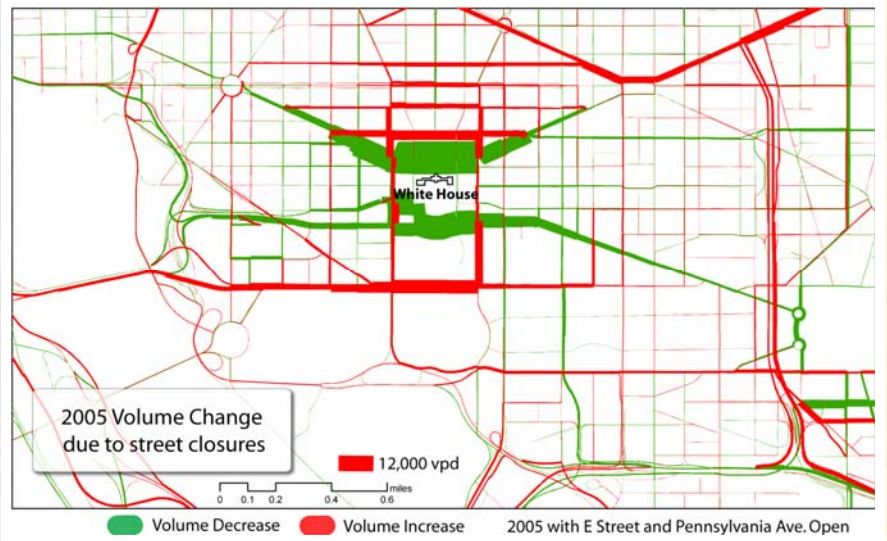


Presenting Results

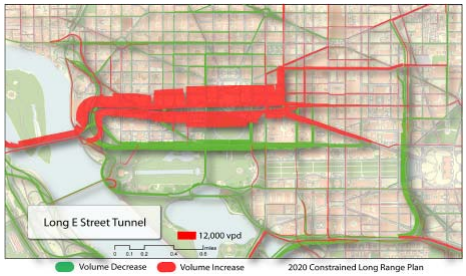




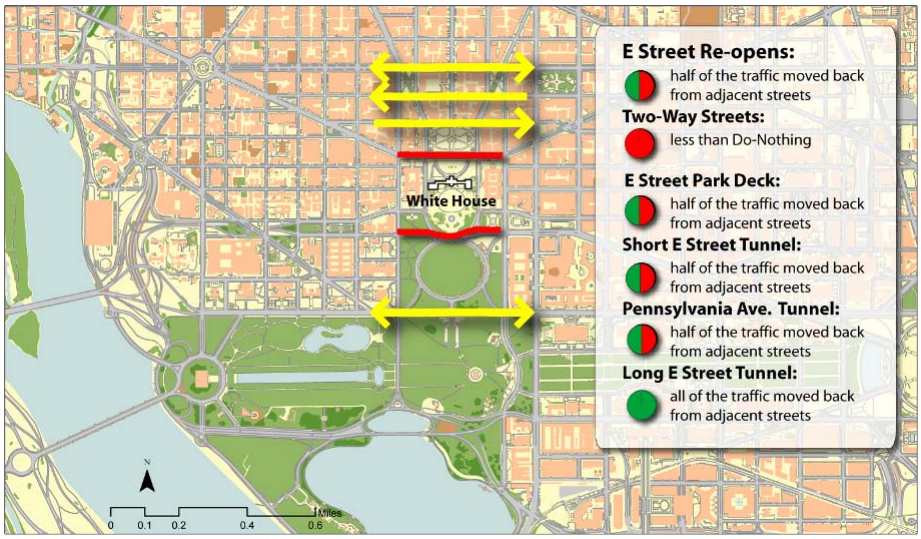
Change in Daily Traffic



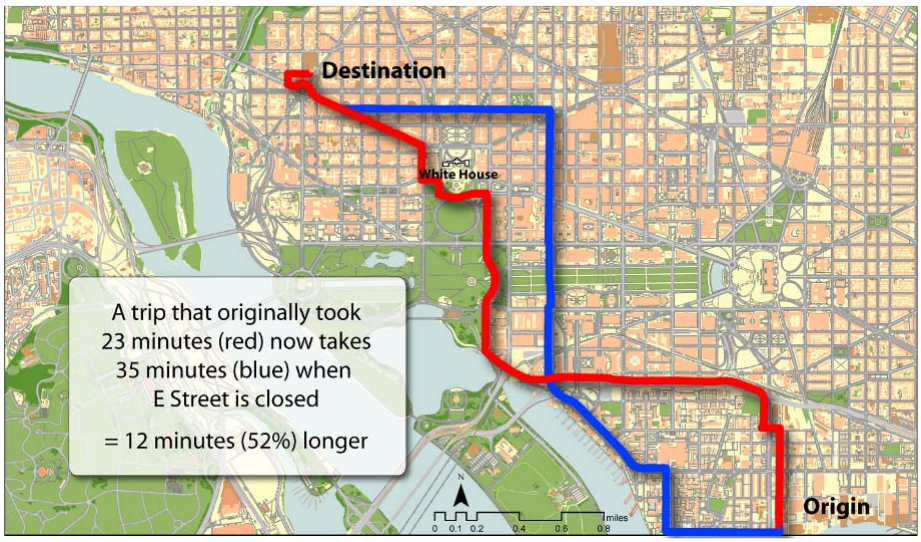
Change in Daily Traffic



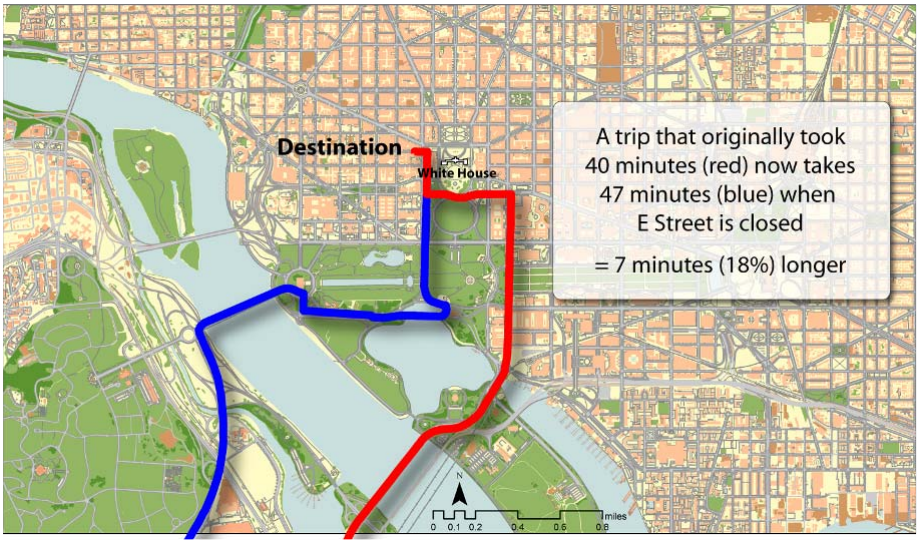
Relieve Adjacent Streets



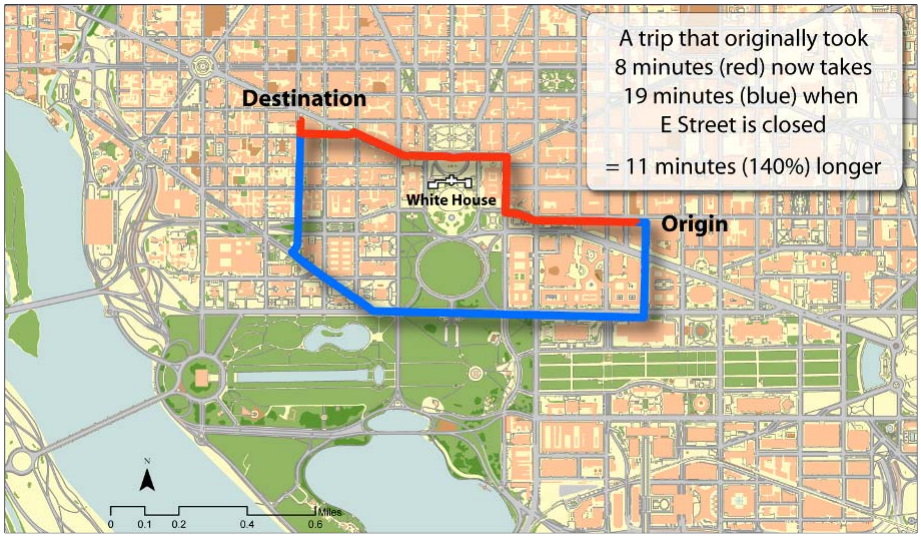
Closings Increased Travel Times



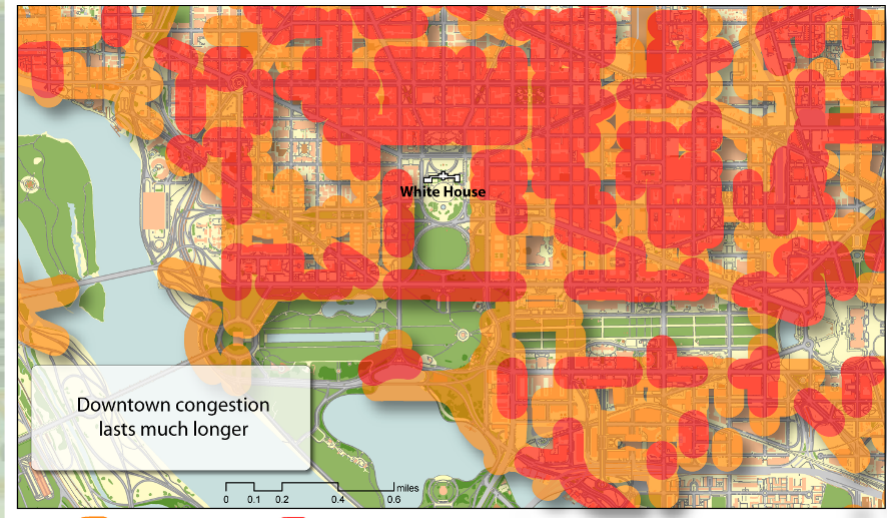
… and Changed Travel Paths



... with Major Crosstown Impacts



Closings Increased Congestion



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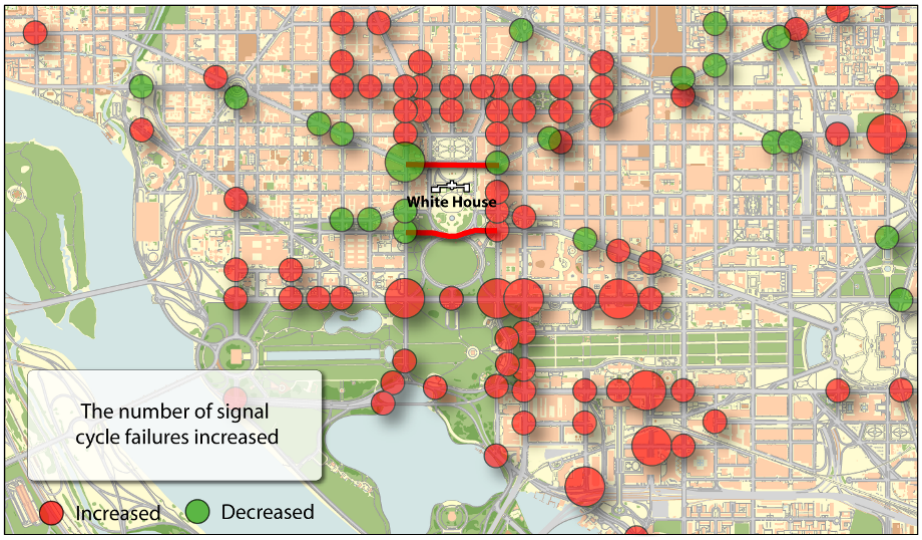
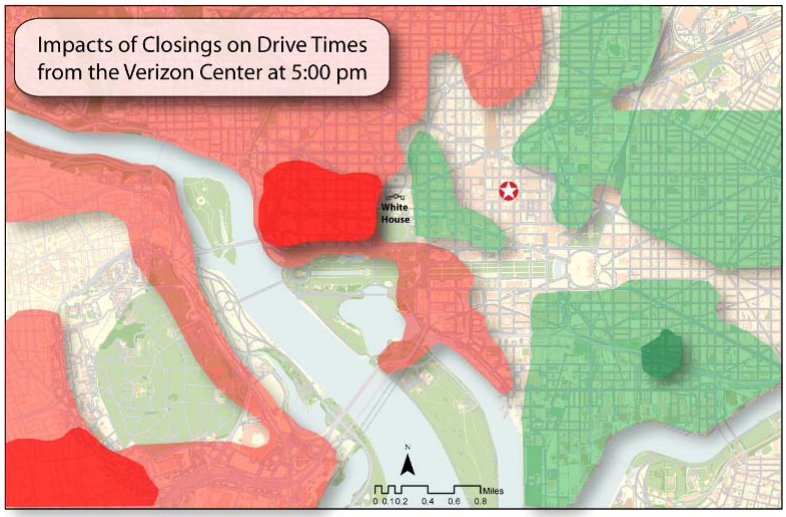
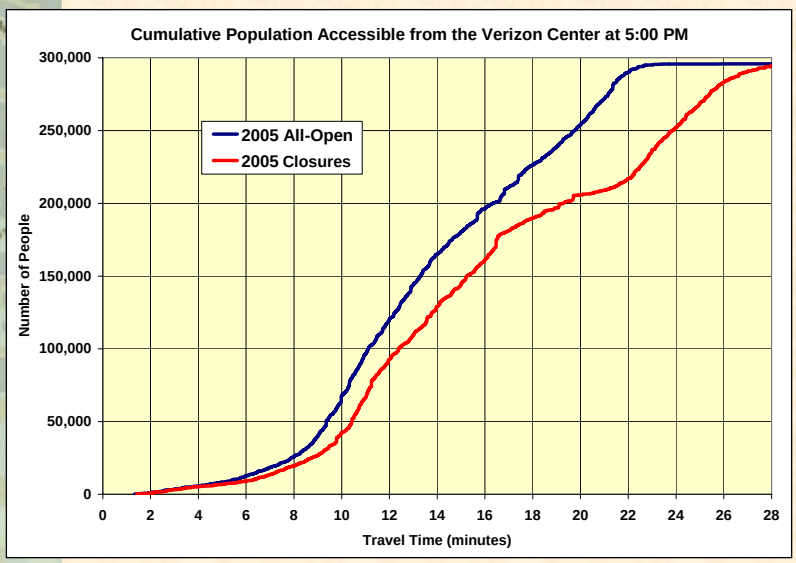


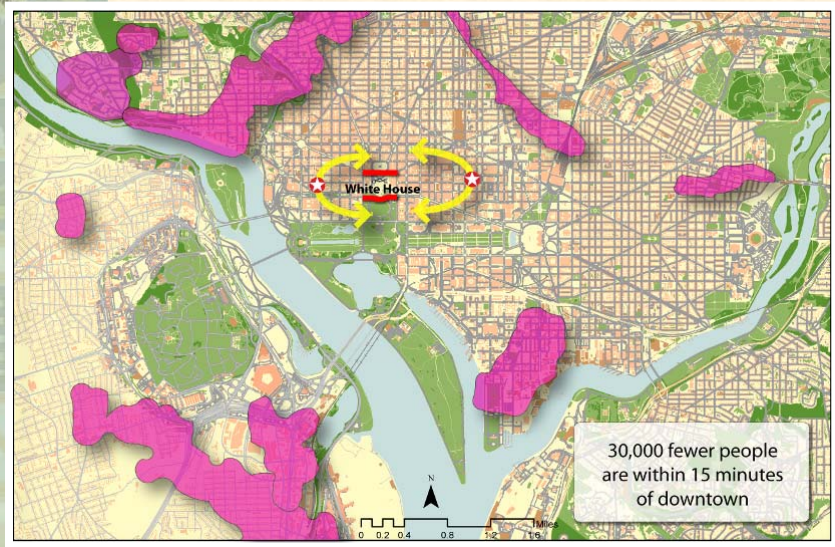
Travel Time Differences

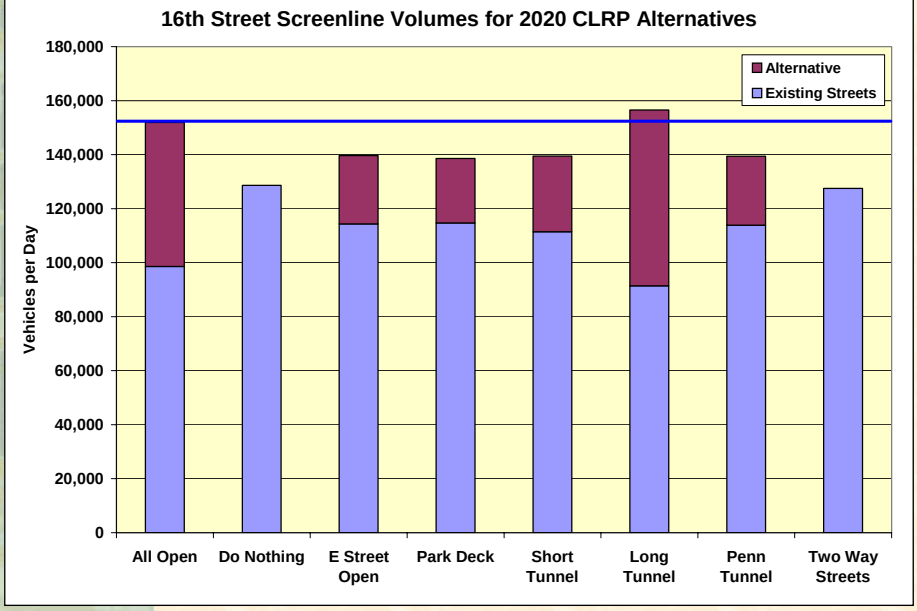


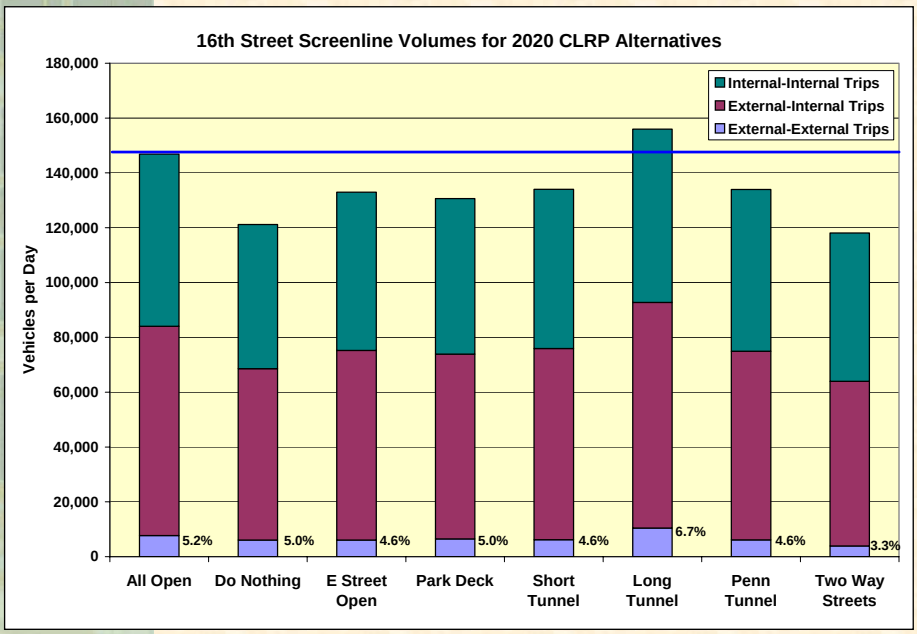
Reduced Accessibility



Closings Reduced Accessibility




16th Street Screenline Volumes for 2020 CLRP Alternatives
Vehicles per Day
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Alternative
Existing Streets
All Open
Do Nothing
E Street Open
Park Deck
Short Tunnel
Long Tunnel
Penn Tunnel
Two Way Streets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180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Internal-Internal Trips
External-Internal Trips
External-External Trips
5.2%
5.0%
4.6%
5.0%
4.6%
6.7%
4.6%
3.3%
All Open
Do Nothing
E Street Open
Park Deck
Short Tunnel
Long Tunnel
Penn Tunnel
Two Way Streets

Visualizing Impacts

Park Deck

Short Tunnel

Pennsylvania Ave. Tunnel

Long Tunnel